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ELECTRIFICATION OF THE OREGON PORTLAND CEMENT COMPANY.
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NOTES ON THE CONVENTION OF THE NORTHWEST ELECTRIC LIGHT AND POWER ASSOCIATION.

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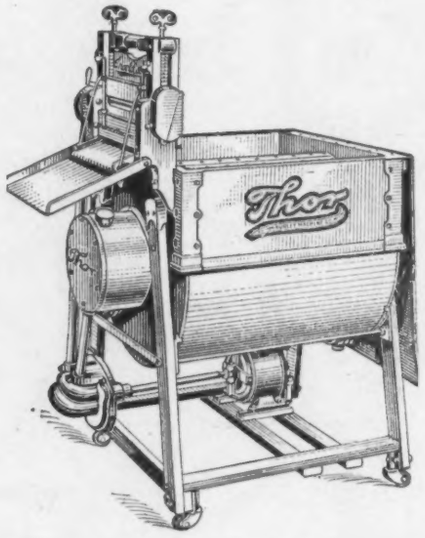

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ELECTRIFICATION OF A MODERN CEMENT COMPANY

BY D. C. FINDLAY.

On June 1, 1916, the Oregon Portland Cement Company made the first barrel of cement ever manufactured in Oregon. The mill is located at Oswego, about eight miles south of Portland on the Southern Pacific railway and on the bank of the Willamette River, thus affording alternative transportation of the finished product.

All the most modern features of cement manufacture have been adopted and every effort made to produce a dustless plant with very gratifying results. The entire construction is of reinforced concrete with every roof built of concrete, practically eliminating depreciation and fire hazard. The Westinghouse Electric & Manufacturing Company, Pittsburg, Pa., supplied the entire electrical equipment which was installed by the cement company.

Fig. 1. General View of Oregon Portland Cement Company.

The power is received at 57,000 volts, 3-phase, 60-cycle, from the Portland Railway, Light & Power Company's transmission line, through a 3-pole air break 60,000 volt pole type switch mounted on a 2-pole structure 8 ft. from the rear of the substation wall as shown in Fig. 2. The power enters the station through aluminum, outdoor type choke coils, and Locke High Voltage roof insulators on to a high tension bus suspended by disc insulators from the concrete roof slab as shown in Fig. 7.

This bus, and all the 57,000 volt wiring consists of ½-in. galvanized conduit, instead of copper tubing, greatly reducing the cost of insulation. All joints in the conduit were cleaned with gasoline, and the couplings sweated to the pipe, insuring as good conductivity as the pipe, which has sufficient carrying capacity for the high tension current.

Taps are taken off this bus, to three single pole knife switches, leading to the high tension series relays, type H.B. which are mounted vertically on insulators. Micarta insulating links, 66 inches long, operate the low voltage relays mounted horizontally on a piece of 6 in. channel, and having adjusting screws to regulate the exact length of the links for tripping. These relays have inverse time limits operated by bellows, which prevent them short circuiting the magnet coil

which keeps the 60,000 volt Type G. A. oil circuit breaker closed, unless the overload is maintained long enough to allow the relay to move its entire travel.

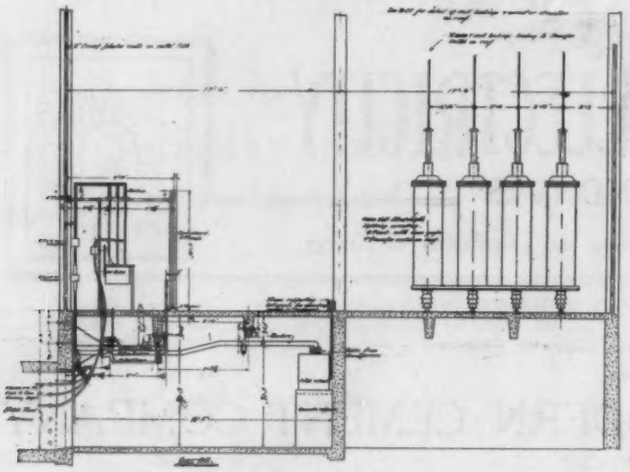

Fig. 2. Substation Equipment and Location.

The magnet coil on the oil circuit breaker also has a snap switch on the back of the board in its circuit, enabling the operator to trip the switch from the board.

Fig. 3 shows wiring diagram of the station. Disconnecting switches mounted on the back of the same structural steel framework over the circuit breaker, which supports the relays, connects to a transfer bus suspended from the roof, from which taps are taken to both 3-phase transformers. Fig. 4 is a photograph of these transformers.

These transformers are 1000 k.v.a., 57,000 volt to 480 volt, 3-phase, water cooled with 4 high tension taps, and are "Y" connected with grounded neutral. Only one transformer is used at a time, the other being held as an emergency spare, and disconnected from the line on both sides.

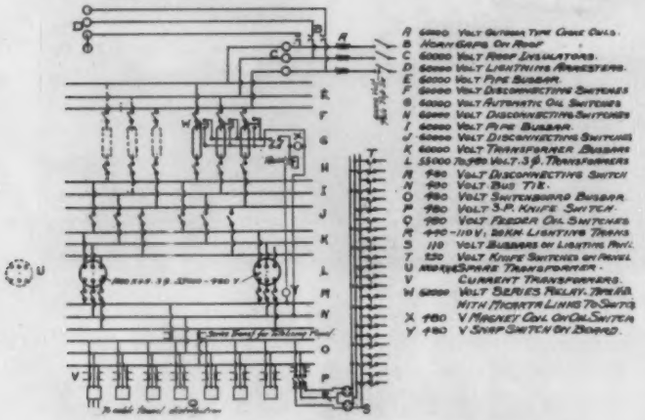

Fig. 3. Wiring Diagram for Cement Plant.

The 440-volt cables leaving the transformers, drop through fibre bushings into the basements, and pass through a novel type of disconnecting switch, consisting of two 3-pole, 1500 ampere unfused, knife switches, with quick break clips, mounted face to face in the ends of a steel cabinet which is supported on a concrete slab, on piers about 5 ft. from the floor.

The bottom of the switches are tied together with heavy copper straps, and from the middle of this, the busbar copper rises vertically through slate protected openings in the top, and passing horizontally under the floor beams, passes through the floor, and directly to the switchboard distribution busbars.

A rigid arm is fastened to the top of each 3-pole switch, which acting through bell cranks and a lever, passes up through the floor to a bell crank on the operating floor, and is opened and closed by the use of a removable handle, after a pin is removed from a hole in the leg of the bell crank, which serves as a positive lock against accidental disconnection.

The cable type current transformers are mounted on the vertical rise of the busbar on an iron frame which supports both the power company's and the cement company's transformers. The secondary leads are taken in conduit through the floor, and directly to the bottom of the totalling panel on the switchboard. Potential transformers for operating the control circuit of the curve drawing wattmeters are mounted under the floor slab in the basement directly below the switchboard.

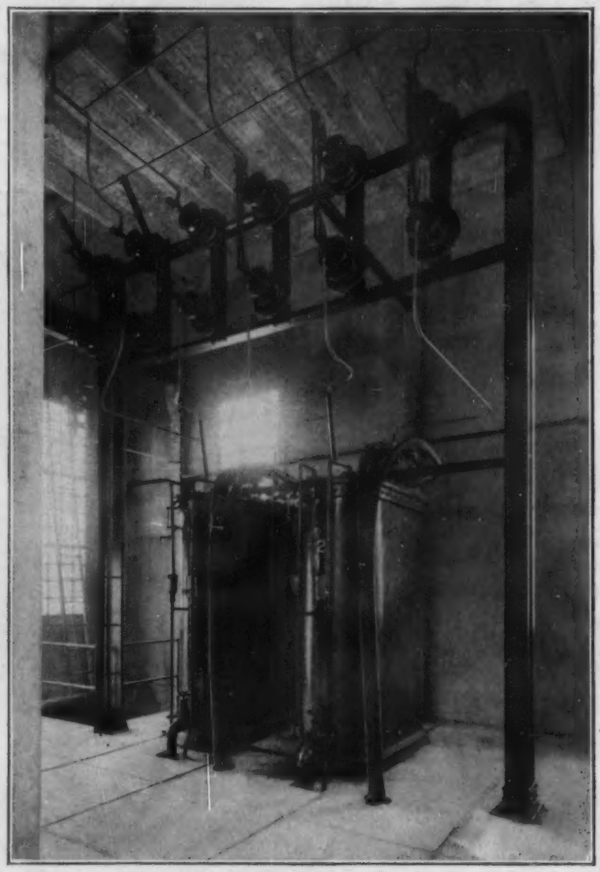

Fig. 4. Transformer Equipment.

On account of inability to procure solid busbar copper in Portland, or vicinity, the expedient was adopted of taping together twenty No. 1 solid bare copper wires into a busbar, and connecting them at all angles, with red brass castings having the wires securely soldered in. This has been very satisfactory.

(To be continued.)

ELECTRIC POWER FOR IRRIGATION PUMPING

DEPARTMENT CONDUCTED BY S. T. HARDING

Concrete Pipe Yard, Inlet to Pipes and Division Box for Irrigation.

CONCRETE PIPE IRRIGATION SYSTEMS.

The conveyance of water secured from pumping plants in concrete pipe is a usual practice in California and to some extent in other states. It is also used on some irrigation systems where water is delivered in relatively small irrigation heads particularly on sloping or irregular land. Water delivered to individual farms in ditches may also be carried to the fields in concrete pipe.

Concrete pipe distribution systems are now used for the large majority of citrus groves in California. Pipe has largely replaced the concrete flumes formerly in use, present construction being nearly all of pipe. It is also used for walnuts and deciduous fruits in those sections where water has a high cost. In some portions of the state concrete pipes are used for the irrigation of alfalfa, where small irrigation heads, such as those secured from pumping plants, may be carried to the fields in concrete pipe and distributed by movable light galvanized iron surface pipe. The concrete pipe used for all these purposes is similar although the stands and other auxiliaries naturally vary with the method used and with crop that is to be irrigated.

A pipe system of field distribution has many advantages over either ditches or flumes. Being below the depth of cultivation, the full area of the field is available for team work. With ditches and flumes special team or hand work is required to prevent the growth of weeds along the ditch. Pipes are more permanent and less liable to injury from farm machinery. The water is more closely under control in a pipe system than in any other method. Small depressions can be crossed without fills or trestles and water can be carried down steep slopes without erosion. The spouts or distributing gates to the furrows are also less liable to become stopped with leaves than in flumes.

Of the different kinds of pipe which may be used, concrete has the advantage of being made from materials which can be secured locally, thus reducing transportation charges, and of requiring a relatively inexpensive equipment for its manufacture. In practically all sections where concrete pipe is in use, contractors can be found who are experienced and equipped to both manufacture the pipe and construct the system complete. The methods of making such pipe have become fairly well standardized and little difficulty is now experienced in getting pipe of satisfactory quality for usual conditions.

For the sizes of pipe used on individual farms, 6 to 12 inches in diameter, the concrete used can perhaps more properly be called a mortar. This is necessary as the walls are only from 1 to 1½ in. thick. A mixture of four parts sand to one part cement is usual for ordinary pipe. In some cases a mixture of 1 to 3 is used where higher pressures are to be carried or where it is desired to counterbalance the effect of poor sand. The latter practice, however, is not desirable, since only clean, well graded sand should be used.

The pipe is made by the "dry mix" process. This is done in order to reduce the number of molds required. The concrete is hand tamped into the molds which are removed as soon as the length of pipe is complete. As a pipe crew may make from 100 to 250 lengths per day, depending upon the size and method of working, the quick removal of the mold materially reduces the cost. The pipes are left standing on a base or bottom ring for about 24 hours. The pipe is then turned and the base ring removed. It is usual to give the inside of the pipe a brush coating of neat cement to increase its freedom from leakage. In some cases lime may be used with the cement in this coating. It is necessary to keep the pipe damp during the period of setting. This is accomplished by sprinkling at in-

Irrigation by Means of Pipe Lines and Furrows.

Sand Box for Concrete Piping, Zigzag and Basin Methods of Irrigation.

tervals for about a week. Proper setting will not take place if the pipe is allowed to dry out before it has become cured.

Denser pipe can be made by using a wetter mix. For pipe which has to withstand considerable pressure and for reinforced pipe such wetter mixtures should be used. For the usual conditions encountered in farm distribution systems the added cost has been considered to be in excess of the benefit.

Concrete pipes are laid sufficiently deep so that the top will be safely below the depth of plowing. Any grading of the land should be done before laying the pipe or the pipe laid to correspond with the final surface. For the smaller sizes, trenches 2 ft. deep will place the pipe below danger of disturbance. Pipes are not used in districts where freezing needs to be considered.

The ends of the pipe are made tapering without any bell. This simplifies both the trenching and laying. The tapered ends are inserted and a collar of mortar placed around the joint. The jointing mortar is usually a 1 to 2 mix. Two foot lengths of pipe are used for all sizes. Longer lengths of the smaller sizes could be handled but the difficulty of cleaning the inside of the joints would offset any advantage due to the reduction in the number of joints. The pressure or head as it is usually called, to which it is safe to subject ordinary concrete pipe, depends on the size of the pipe and its thickness. The usual thicknesses and the maximum pressure heads which should be permitted are shown in Table 1. If surges or conditions resembling water hammer are to occur, less pressure heads should be used. Such surges should not be permitted. For this reason it may not be desirable to connect the concrete pipe directly to the discharge of a pump. Where feasible a stilling box should be used, into which the pump discharges and from which the water flows into the pipe line. This can be done when the water flows away from the pump by gravity. Where water is forced to higher ground wood or steel pipe should be used if the pressure exceeds the figures given in Table 1.

TABLE I.

Allowable Pressure Heads for Ordinary Small Plain Concrete Pipe.

Diameter of pipe in inches.	Thickness of pipe in inches.	Allowable Pressure Head in feet 1:4 mix.	1:3 mix.
6	1⅛	16	20
8	1¼	14	18
10	1⅜	12	16
12	1½	10	14

The cost of concrete pipe depends on the quantity to be used, the cost of gravel and cement, the length of haul from mixing yard and the experience and character of the labor used. The various factors cause the cost to differ to some extent in different localities. For the amount of pipe used on the average size of individual farm, it is cheaper to have the manufacture and laying of the pipe done by contract. Dependable local pipe yards and contractors can now be found in nearly all localities where much pipe work is being done.

The usual costs of concrete pipe are given in Table II. These are arranged to give maximum and minimum as well as average figures. Under unfavorable

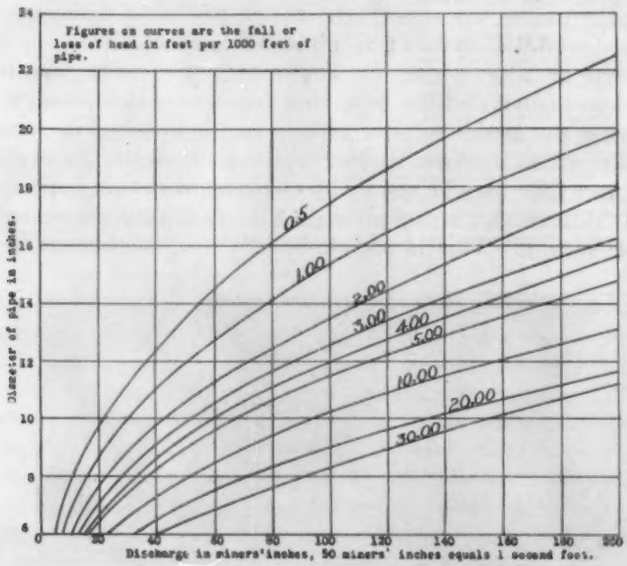

Fig. 1. Carrying Capacity of Concrete Pipe in Cubic Feet per Second.

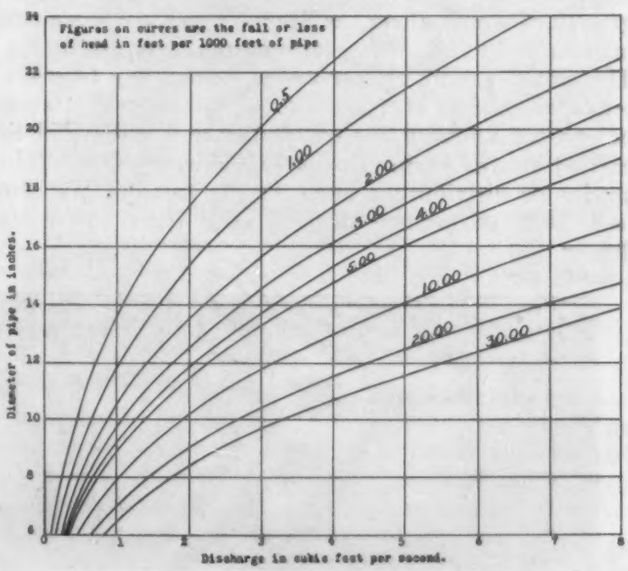

Fig. 2. Carrying Capacity of Concrete Pipe in Miners' Inches.

conditions for material or for small jobs of less than 1000 ft. the maximum figures become a safer basis of estimate. For very favorable conditions the minimum costs can be used. For ordinary conditions the systems should be secured for the average figures.

TABLE II.
Cost of Small Concrete Pipe, 1:4 Mix., in Cents per Lineal Foot.

	Size of Pipe in Inches.			
	8	10	12	14
Cost of pipe, only.				
Usual minimum	9	11	15	20
Usual maximum	15	18	25	40
Average	12	15	20	30
Cost of pipe line—laid, including trenching and back filling.				
Usual minimum	15	18	25	35
Usual maximum	20	25	35	50
Average	18	22	30	42

Pipes of 8 and 10 in. diameters when made of 1:3 mixture cost an average of about 3 cents per foot more than the 1:4 mixture.

The costs given are for the pipe lines only. They do not include the stands, gates and other auxiliaries.

Figs. 1, 2 and 3 give the usual carrying capacities of small concrete pipe in different units of measurement. The unit of measurement in general use in the portions of California where such pipe lines are used is the miners' inch equal to 1-50 of a second foot or 9

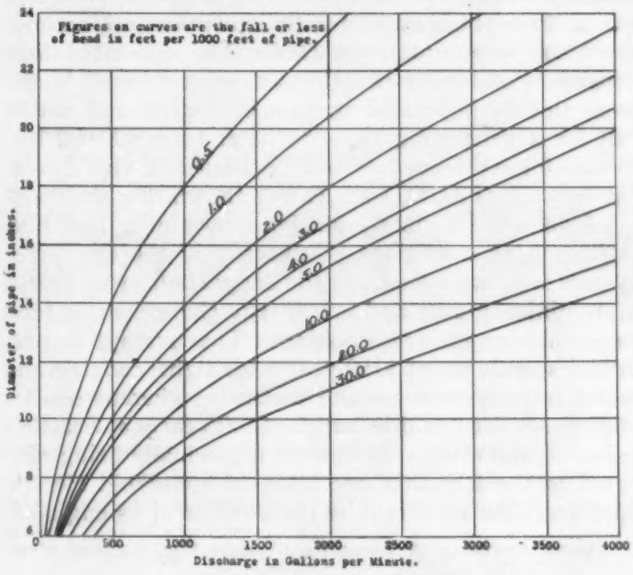

Fig. 3. Carrying Capacity of Concrete Pipe in Gallons per Minute.

gallons per minute. The value of the miners' inch in other states may differ. The statute value in California is 1-40 of a second foot. The curves for carrying capacity are given in three units. All other units can be reduced to cubic feet per second or second feet as it is more commonly called. In connection with pump capacities, the unit of gallons per minute is sometimes used. Four hundred and fifty gallons per minute are equal to one cubic foot per second.

The carrying capacity for a given pipe varies with the square root of the slope. In order to double the velocity and capacity it is necessary to increase the slope by four times.

With open ditches the slope available is in general limited to the natural fall of the ground. With pipe lines under pressure it is possible to secure the equivalent of additional slope by having the water enter the pipe line under some initial pressure. This may be of advantage in reducing the size of pipe required on flat slopes. Also the pressure may be used to force water against the slope of the land.

The carrying capacities given represent average conditions. They are based on a value of "n," the friction factor in Kutter's formula, of 0.0135. For pipes having a cement coating that are carefully laid true to line and grade, the capacity may exceed the figures given. For pipes laid without careful cleaning at the joints and not true to line the capacity may be less than shown. Any deposit of silt or sand reduces the capacity correspondingly. Where sand is present in the water, the use of a sand box such as that shown in the illustration is desirable. This is sometimes the case with water pumped from new wells.

The majority of pipe systems for single farms consist of 8 or 10 in. mains. Where the heads are small 6 in. pipe is generally used. This condition may occur on the lower ends of distributing lines, the size of the pipe being reduced for the last two or three hundred feet. A combination of 10 and 8 in. sizes is more usual than that of 8 and 6 in. For some conditions such as flat grades or large heads pipe larger than 10 in. in diameter may be used although this is not usual.

The irrigation streams or heads handled in pipe lines usually vary from 25 to 60 miners' inches. To carry 25 inches in a 6 in. pipe requires a grade of 10 ft. per 1000 ft. For the same head in 8 in. pipe only 3.5 ft. per 1000 are required. To carry 60 in. in an 8 in. pipe a grade of about 15 ft. in 1000 ft. is required. The same quantity can be carried in 10 in. pipe on a grade of 4 ft. per 1000 ft. A grade of 4 ft. per 1000 ft. is equivalent to a total fall of 2.5 ft. across the end of a 10 acre lot or in 660 ft. This amount of fall is usually available or can be secured by having the water enter the line under some pressure. For this grade 8 in. mains will carry about 35 miners' inches and 10 in. about 60 in. Where over 40 in. is to be handled the use of 10 in. pipe is preferable unless there is more than average fall to the land.

QUICK EMPTYING OF A CANAL.

Shutting water out of a canal too quickly may cause damage from bank caving. This may occur where a break makes it necessary to reduce the discharge as soon as possible. The water contained in the saturated earth on the sides of the canal may cause the banks to slip before then can drain. This is most likely to occur in the heavier soils and on canals where the conditions of construction or operation have resulted in forming steep or vertical banks. Such caving may occur on canals of pumping systems if the pumps are quickly stopped. Such canals are more usually built on flatter grades and with more care than has been the case with many of the older gravity systems. It has also been noticed on canals which may operate normally without erosion, that cutting is liable to occur when operation is renewed if for any reason it is necessary to turn the water out for a period and then restore the full flow quickly.

NOTES OF THE A. I. E. E. CONVENTION AT SEATTLE

The Pacific Coast convention of the American Institute of Electrical Engineers at Seattle was called to order at 11 a. m., September 4th, by Professor C. E. Magnusson, who first introduced Mayor H. C. Gill. Mayor Gill, after telling of Seattle's electrical preeminence extended cordial welcome. Fitting response was then given by Professor H. J. Ryan, who briefly reviewed the wonderful works recently accomplished by the members of the organization here represented and also expressed their appreciation of Seattle's hospitality.

President H. W. Buck was then introduced as the presiding officer for the sessions. After emphasizing the value of territorial meetings in nationalizing the Institute, President Buck introduced the several authors who read papers as abstracted hereafter.

President's Address.

President H. W. Buck after paying high tribute to Western daring and initiative in engineering accomplishment, spoke briefly on the Engineer's Standing in Society. Though most great changes in modern progress have been brought about by engineers, this fact has not been appreciated by the public largely due in the opinion of the speaker, to the engineer's prejudice against business matters. Mr. Buck urged that engineers acquire a broader viewpoint and become a more active factor in development work. The A. I. E. E. has already contributed greatly to engineering progress. Of the problems of the immediate future the most pressing is correcting defective insulators, "the curse of the electrical business today," causing most of the troubles experienced from lightning and from surging. After showing this dependence of electrical upon other branches of engineering, he pointed out the value of co-operation. While the war has emphasized the engineer's importance in military matters, the fact should not be forgotten that engineering is equally important in times of peace.

A Distribution System for Domestic Power Service From Commercial and Engineering Standpoints. By Carl H. Hoge and Edgar R. Perry.

Edgar R. Perry, a commercial engineer for the Puget Sound Traction, Light & Power Company, has in this paper, together with C. H. Hoge, worked over the problem of distribution for domestic service in order to accommodate the ever-increasing demands for new electric household appliances.

The adoption of electric heating and cooking has begun to reach such large proportions that the average distribution system is unable to take care of the increased load. As the domestic power load in all probability will increase until every house is electrically equipped, this paper has endeavored to lay out a distribution system to take care of this class of business and to estimate the revenue to be derived from it. Units of load, consumption and revenue were taken from tests conducted in different parts of the city and applied to a definite section of the city thought to be representative, as it contained every class of house with schools, churches, etc. In view of the results obtained, it would seem seem that this business would be profitable at a still lower rate, and that it would be advisable for the central station man to make provision for this increased load when rebuilding any lines in the future.

In conclusion the authors believe that the development of domestic power will necessitate the complete reconstruction of existing lines. New substations will have to be built for each 10,000 kw. of load and located approximately at the center of the district served. The heavy load in this service will require three-phase distribution, which will also take care of small power loads. They believe that domestic power can be developed into a profitable part of the central station business, and sold at a price that will be attractive to the consumer. The present rate schedules, which necessitate two meters and a flat cut-in for this business, are not satisfactory and a new basis for charge must be developed that will utilize a simple, inexpensive meter and can readily be understood by the layman. With increasing volume of business, the rates can be lowered materially below those quoted herein, and still yield an adequate return. It is up to the central stations to make an intensive campaign for domestic power service, for this is the solution of the problem of profitably serving residence business.

The discussion was participated in by D. F. Henderson, J. B. Fisken, M. T. Crawford, F. D. Weber, C. R. Collins, W. D. Peaslee, E. G. Robinson, S. M. Kennedy, H. W. Buck, W. L. Chrysler, H. J. Gille, R. F. Howes and E. R. Perry. During the discussion it was brought out that the hypothetical distribution was a three-phase system with return neutral, secondaries not being interconnected. The estimated load density is at least twice that at present found in the most thickly populated portion of Seattle and would call for a generating capacity of at least 400,000 kw. to care for residence business as compared with a present demand of 25,000 kw. It was shown that the cooking load will ultimately be the determining factor as regards peak conditions. Advocacy of the one-meter system was confirmed and the suggestion made that a high minimum rate and low energy charge would tend to encourage electric cooking. The average householder spends about $150 yearly for light, cooking and water heating with present methods, whereas similar electric service could be had for $200 yearly at Seattle's experimental rates. The public is gradually being educated to the fact that operation of household electric appliances does not require the services of an engineer.

Some Features of Domestic Electric Cooking and Heating. By H. B. Peirce.

The author is assistant commercial agent for the Washington Water Power Company, and is engaged in building up the electric cooking and heating load for his company.

Although electric cooking and heating has always been considered possible, it has only recently become popular; hence the engineer is found unprepared with information on the characteristics of the load.

From tests made on a number of domestic cooking and heating installations, it would appear that electric cooking has a better load factor than a lighting load and that this load factor improves as the number of ranges increases.

The errors incident to these tests are discussed.

The demand factors on being plotted against number of ranges appear to follow a logarithmic curve, which may be accounted for by the fact that a modification of the law of probability would no doubt determine the probable coincident demand of a number of ranges and that this law is a logarithmic function.

Suggestions are made for the checking of these results by others.

In the heating field, the effect of water heaters superimposed on range loads is discussed in relation to their effect on the central station loads and income.

Those participating in the discussion included J. B. Fisken, C. E. Magnusson, W. D. Peaslee, Ralph W. Pope, C. R. Perry, H. F. Holland, H. J. Gille.

Electrical heating of buildings was shown to be practical in communities where there is not too great a variation in temperature and where off-seasonal uses for the power could be found. A short circuited induction heater having 98 per cent power factor was suggested as less expensive than resistance type heaters requiring frequent replacement of elements, but was shown to be so sensitive to voltage variations as to be impracticable. Under test a 2 per cent change in voltage gave 40 per cent variation in current. Because of limited supply of hot water where an electric heater is alternated with the range, a flat rate was advocated for water heating. Any system whereby electric house heating be considered as an auxiliary to other heating methods would fail because people would not install duplicate systems.

Temperature Rise of Insulated Lead-Covered Cables. By Richard C. Powell.

The author of this paper has had extensive experience with insulated lead-covered cables in Oakland, California, and the San Francisco Bay region, where he is with the Pacific Gas & Electric Company in their underground construction work.

After a brief historical note the factors that determine the rating of a cable are considered.

The thermal conductivity of a cable is expressed in terms of the volume thermal conductivity of the insulation, the surface thermal conductivity of the lead sheath, and the dimensions of the cable. The values of the thermal conductivities as given by various observers, including the author, are compared. A diagram is shown for readily obtaining the thermal conductivities of one-conductor cables, and tables are given of the carrying capacity of one-conductor cables for various duct temperatures and thicknesses of insulation. Factors are added so that the carrying capacity of multiple-conductor cables may be taken from these tables.

Sometimes the lead sheath of a cable carries considerable stray current. A formula is given for calculating the increased temperature due to such current.

The carrying capacity of a cable is largely determined by the thermal properties of the duct line in which it is installed. This feature is discussed briefly.

The overload or intermittent rating is calculated from a formula involving the thermal capacity of the cable multiplied by a factor. Experimental values of this factor for several types of cables are given. A formula is given to take account of variable air temperature.

Various formulas given in the paper are developed in three appendixes.

Discussion was confined chiefly to the effect of parallel or crossing steam mains on electric duct lines. L. T. Merwin cited experience where a flood saturated the ground and the water surrounding both the steam mains and electric duct lines was raised to a temperature of 228 degrees above the usual heating of the lines. However, by means of artificial flooding and cooling there was only one failure in 14,000 ft. of cable. The author's figures were shown to be ultra-conservative as regards safe carrying capacity. H. W. Buck told of experiences at Niagara Falls which taught that with a.c. single conductor cable should be avoided where possible as the unavoidable current loss in the lead sheath was practically equal to the copper loss. The heating effect was great enough to carbonize the paper insulation. Suggested cooling methods included a parallel pipe filled with running water or a vacant central duct through which air may be forced as needed and also giving a convenient method of determining temperature. Others contributing to the discussion included M. T. Crawford, J. B. Fisken, S. C. Lindsay any C. R. Collins.

Inductive Interference as a Practical Problem.

A. H. Griswold and R. W. Mastick of the Pacific Telephone & Telegraph Company, after briefly reviewing the factors causing inductive interference in telephone lines from high voltage power transmission circuits, took up from a practical standpoint the methods actually employed to bring about mitigation of voltage arising from balanced lines and to minimize residual currents. Higher harmonics must also be eliminated from the power lines and abnormal operating conditions guarded against. The equilateral triangle construction was shown to cause less trouble than either vertical or flat construction. Transpositions co-ordinated along both power and telephone circuits are the simplest and most effective means for remedying inductive effects caused by balanced voltages and currents, the inductive effect thus being neutralized in the case of the power circuit and equalized with the telephone circuit. On the other hand, the "longitudinal" induction from residual voltages and currents can be cured only by reducing or eliminating the residuals in the power system. One of the most effective means is not to ground the transformer neutrals except at generation and main distribution stations. These typical cases of mitigation methods were worked out in detail for appendix gives detailed direction for making a survey of power and telephone lines preparatory to calculating the mitigation of induction.

The paper was discussed by Frederick Bedell, L. T. Merwin, J. B. Fisken, W. D. Peaslee, C. A. Robinson, L. J. Corbett, C. A. Whipple and R. W. Mastick. In the course of the discussion it developed that the telephone company had tried out all the possible remedies, such as shunts and series impedances, but had discarded them in favor of those described in the paper. Any scheme for fitting out the higher harmonics seriously cuts down the range of transmission. The objection to flat construction is simply the matter of cost, more frequent transpositions being required. Defective and grounded power insulators cause serious disturbances on the telephone lines, as likewise does the charging of electrolytic lightning arresters. Care in the accurate location of transpositions in the field was shown to be essential to the success of any plan for mitigation. J. B. Fisken stated that the grounding of transformer neutrals only at generating stations and important substations would help the power operator as well as the telephone man. The most important feature of the entire discussion was the evidence of the growth of the spirit of co-opertaion and mutual understanding between the power and the telephone companies. The practical methods for correcting inductive interference have not proven so burdensome to the power companies as originally had been feared, and each side seems to be working to help the other.

Testing for Defective Insulators on High Tension Transmission Lines. By B. G. Flaherty.

The author is district operating agent for the Puget Sound Traction, Light & Power Company.

This paper discusses the importance and necessity of field tests on high-tension insulators and three methods of making such tests, viz.: with the oscillator, the megger, and the telephone receiver. The latter is described in detail, and some data given on its development and use on a 60,000-volt line in Western Washington, covering a period of 2.5 years. Laboratory checks on 13 of the defective insulators located are given, and an approximate relation established between the telephone receiver test and the break-down value at 60 cycles. Success of test is shown in note on its effect on operation.

Figures from regular routine tests show percentage defect on various lines, and cost of locating and replacing defective units is given at $1.13 each (labor only), and cost of testing only was 2.3 cents per insulator on the line.

A method of studying the rate of depreciation is outlined and some data given in illustration.

Professor H. J. Ryan outlined the plan of investigation now under way at Stanford University to devise some means of correcting insulation troubles. A study of porcelain shows that its porosity is the cause of the failures experienced in its use. Porous materials are not permanent, a porous body being one which absorbs up to 3 per cent of its weight of water. For insulators this figure should be limited to 0.1 per cent. Porcelain's high temperature of vitification and high resistivity temperature coefficient, not losing its insulating properties until 450 degrees C. is reached, makes it desirable as an insulator. Furthermore the resistivity of many porcelain insulators taken from the lines is not changed by "drying out," though with some the resistivity is thus increased. If insulators are dried out for several hours at 125 degrees C. they absorb moisture very slowly. Uniformity in product is the great inherent difficulty in the manufacture of porcelain. Vitrified quartz arrow heads, the product of a lost art, would make an ideal material for the purpose. Fused quartz withstands corona discharges while porcelain does not, it is everlasting.

L. T. Merkin had found wireless dispatcher's set to be a practical means for detecting defective insulators while driving along a transmission line at 15 miles an hour.

E. A. Loew emphasized the need for a practical method of testing porcelain insulators on the lines if their use is to be continued. Such a method should be cheap, reliable and should eliminate the personal equation.

John B. Taylor in contributed discussion stated that the proposed method required extreme caution on the part of the operator and was only adapted to wooden poles.

Others taking part in the discussion were M. T. Crawford, W. D. Peaslee, Ralph, W. Pope, Chas. Osborne, Mr. Harding and C. E. Magnusson. Mr. Osborne detailed break-down tests and lightning experiences where porcelain insulators did not fail.

The High-Voltage Potentiometer. By Harris J. Ryan.

Professor Ryan, of Stanford University, has long been known as an investigator of high voltage and high frequency phenomena. In this paper the author describes a high voltage potentiometer which may be made at reasonable expense, consisting of a water resistance potential distributor and a sparking probe potential difference detector. The water resistance consists of a column of water moving slowly through an ample length of garden hose, and tapping in points through which to connect the probe are provided by breaking the hose at regular intervals and connecting it with any of the plain metal connectors found on the market as "hose menders." The result of an integrity trial are charted in the figure. The device is intended for investigations in which the results are not required to be known within 2 or 3 per cent of their actual value.

Frederick Bedell and W. D. Peaslee paid tribute to the value of this paper.

An Artificial Transmission Line With Adjustable Line Constants. By C. Edward Magnusson and S. R. Burbank.

Professor Magnusson, a life member of the Institute, and a joint author of this paper, has conducted numerous experiments upon artificial transmission lines in his electrical laboratories at the University of Washington.

A description is given of an artificial transmission line which can be readily adjusted to represent 200 miles (321.86 km.) of commercial transmission lines of any spacing up to a maximum of 120 in. (3 m.) and any size wire up to 4/0 copper. It can also be made to correspond to aerial or cable telephone lines and to power cables. The use of this type of line in laboratory courses on transmission line phenomena is illustrated by a number of typical experiments. It is shown that quantitative data, sufficiently accurate for instructional purposes, may be obtained by using portable voltmeters and ammeters and by the oscillograph.

That artificial transmission lines can be used to advantage in investigations on transmission line phenomena is well known. It has been proved by extended research that actual transmission line phenomena can be accurately reproduced in laboratory structures, and that the theoretical equations correctly express the quantitative relations between the line constants, voltages, currents, time and space phase angles and other factors that enter in the general transmission line problem. Artificial transmission lines have, however, been used only to a very limited extent either as laboratory apparatus for experimental work by students in power transmission courses, or by engineers when investigating industrial transmission systems. Very few engineering colleges have any facilities for laboratory work on transmission lines. The instruction is given by lectures, text-book recitations and class-room problems, without the aid of quantitative laboratory experiments. As a consequence comparatively few students gain a clear insight into transmission line phenomena, and although they may be able to develop the standard equations, they fail to comprehend the physical phemonena involved or to understand what actually takes place in the transmission system.

Participants in the discussion included H. J. Ryan, L. J. Corbett, W. D. Peaslee, J. D. Ross, C. A. Whipple and C. E. Magnusson. Difficulties to be overcome in such work was discussed and suggestion made that central stations might well have such a laboratory to try out experiments. The value to the teacher, student and layman was emphasized.

Electrical Operation and Merchandizing in Small Towns.

This paper by Lewis A. McArthur and C. R. Young of the Pacific Power & Light Company, and W. F. Farquhar of the Washington Water Power Company, gave details of operating accounting and new business methods of small branch offices. In the former case 16 local managers, clothed with considerable authority, report directly to the vice-president and general manager, who has charge of all operating and new business affairs, and are accountable to the accounting department. Meter reading, collections, payrolls, small ex-

penditures, and the consumer's ledgers are handled locally Bills are addressed at a central office. Stationary forms are standardized. Audits are frequent. Competitive prizes are awarded for best show windows, reduction in outstanding delinquents and smallest store accounts. Small community merchandizing is done by local managers, supplemented by concentrated competitive sales campaigns. Standard lines of electrical appliances are carried in stock and demonstrated.

Mr. Farquhar summarized reasons why central stations do merchandizing and wiring, and explained their plan of organization whereby each town is a nut under the supervision of the general agent. Small towns are covered by local merchants who are sold supplies at 10 per cent above cost for resale at a profit and are paid a small salary as fix-light men. These are supplemented by a sign salesman and a range specialist, as well as extensive advertising in one morning paper given general distribution throughout the territory. The merchandise account shows a profit of $2 for every account on the line. The stock of wiring materials and fixtures was turned over three times during 1915. An aggresssive wiring campaign is being carried on by a force of fifteen specially trained college men.

Overhead Line Construction Rules.

This paper by M. T. Crawford of the Puget Sound Traction, Light & Power Company, presented arguments demonstrating the unreasonableness of Washington rules specifying line construction details. They are especially objectionable because of retroactive features and lack of definite certainty as to meaning after companies have already complied with expensive city ordinances and because they are likely to be superseded in turn by the National Safety Code. The rules increase the cost of new construction from 10 to 25 per cent in the case of city and 10 to 15 per cent in case of rural lines. This, together with additional advance in cost of materials and severe reduction in revenues, have allowed an average of but 20 per cent of existing lines to be reconstructed in accordance with the rules. Unless relief is provided companies will be sorely tried to meet complete conformity by 1918. Furthermore, the National Safety Code is not locally acceptable because it is not believed that it will be applied with intelligence and proper consideration of local conditions. It is remedially suggested that rules be used only in an advisory manner and not given enforced application to widely varying conditions and that the laws be confined to the definite fixation of liability for accidents due to line equipment and the requirement of financial responsibility before constructon and operation is permitted. The Oregon and Idaho rules are believed to be reasonable. Brief specifications are given for lines conforming to the Washington rules.

Characteristics of Admittance Type of Wave Form Standard. By Frederick Bedell.

Professor Bedell has long been recognized as an earnest student of electric wave phenomena and has added much to our mathematical and practical knowledge of the subject.

It is generally agreed that a sine wave of electromotive force at generator terminals and on transmission lines is best. A sine wave is now specified as standard by the Standardization Rules of the Institute, but the present methods for prescribing allowable limits and for determining how near an actual wave is to a true sine wave are very unsatisfactory. The Standards Committee, through a sub-committee, is studying the subject in order to ascertain whether a standard can be specified that will be more suitable in its characteristics and more practical in its application. As a contribution to this study, the characteristics of a certain type of standard are here set forth.

It is hoped that various points of view and much information may be brought out in discussion, which may be on the general subject and not limited to the particular phase discussed in the paper.

After describing the two types of standard possible—namely, the simple and the composite—the author then discusses the proposed admittance types and leaves for discussion certain questions of specification that must be decided upon if this type is to be adopted. Some of these points are as follows:

1. Shall the standard circuit be a simple circuit, as described in this paper, or a composite circuit?
2. If a simple circuit is to be adopted, shall ths circuit contain an inductance and, if so, how much; or, in other words, what shall be the resonant frequency?
3. How much resistance shall the standard contain? Should this resistance be different for circuits of different frequencies, or should it be the same for all frequencies?
4. What numerical value of the factor thus specified should be allowed in acceptance of alternators?
5. What details and what load conditions conducting tests should be specified?

The discussion was opened by R. W. Mastick, who read an exhaustive discussion submitted by the joint committee on inductive interference and recommended a frequency of at least 1500 cycles for the resonant standard.

L. T. Merwin stated that the practical man would be interested in the paper's proof of the detrimental effect that certain high harmonics may have in bringing about resonance in branches of a power system as well as in affecting nearby telephone systems. These may be overrun by inserting impedances in completed networks and designing future systems so as to obviate such troubles. In case of a simple parallelism with a telephone line a system of transpositions will solve the difficulty. Any standard that may be used as a basis of penalty should apply particularly to the higher frequencies which affect telephone lines.

L. J. Corbett suggested the generator might give a sine wave which would be distorted at various points on the line. H. J. Ryan then discussed the effect of line and load conditions on the harmonics. C. E. Magnusson read W. M. Chubb's discussion endorsing Prof. Bedell's paper.

Replying to a suggestion that harmonics be penalized not in point of order but of frequency, W. D. Peaslee showed the absurdity of such a plan. He criticized the telephone men's reticence in sharing what information was shown by their experiments and the tendency to put the next move up to the power man, whereas it is time for the telephone man to lend his assistance.

In closing the discussion Dr. Bedell stated that any standard which varied with line and load conditions would not be satisfactory. At first only a simple approximation to a standard can be adopted. As engineers become more accustomed to its use a more complex standard may then be tried.

In answer to a query by R. E. Boykin, H. J. Ryan explained that even 0.1 per cent of water renders high grade porcelain insulators defective. At a temperature of 450 degrees C. porcelain has the same conductivity as carbon, no matter what formula is employed in the mix. The composition of the porcelain, however, has a great effect on the porosity.

W. D. Peaslee, in closing the discussion, stated that neither air-break nor oil-break switches are as responsible for the transients as are the characteristics of the line itself. He stated that mechanical

failures of insulators are largely due to the terrific bombardment which takes place in the zone of flux concentration. He suggested that a sphere-gap would be more effective than either a horn-gap or point-gap in filtering out transients. He also urged greater co-operation between the practical power men and the men in the college laboratory.

Insulator Failures Under Transient Voltages. By W. D. Peaslee.

The author of this paper is a consulting engineer of Portland, Oregon. He has had extensive experience in the study of failures of insulators under transient voltages.

The operation of a high-voltage transmission line involves changes in energy distribution that are very conducive to high-frequency disturbances and transients of very steep front. These are often superposed on the normal frequency voltage of the line in such a way as to impose great stresses on the insulators.

The mechanism or failure of an insulator is of great importance to those designing and operating transmission lines. This paper presents the results of recent investigations on the failure of insulators under impact and combined impact and normal-frequency voltages. Miscrophotographs of the resulting failures are included.

The breakdown of a dielectric involves energy which is a time function and the importance of the duration of the stress in determining the magnitude of the voltage necessary to puncture an insulator is discussed.

Due to the short duration of transients, insulators are often punctured repeatedly by them, the porcelain in the puncture solidifying again on account of the small energy involved. These sealed punctures, however, weaken the insulator, lowering its dielectric strength materially. The importance of the elimination of air holes and defects in the porcelain is shown. Some essential features of a successful line insulator are stated.

J. B. Fisken questioned the author's statement regarding the harmfulness of air-break switches. His experience has never shown a serious trouble from air-switching. He suggested that a metallic coating in the top of the insulator would minimize disturbances.

Robt. Howes read a discussion demonstrating that this paper would give the user and purchaser of insulators a better understanding of the conditions under which they must work. He cited his long experience where no such failures had resulted and assigned as the reason the fact that he had always insisted upon insulators having a sufficient factor of safety and that he had always located lightning arresters exactly at the terminals of impedances.

L. T. Merwin stated that the problems of the academic men are prophetic of the practical man's problem. He spoke of the value of college laboratories in pointing out the dangers to be expected and urged that these notes of warning be heeded.

H. J. Ryan stated that the paper gave a correct explanation of the manner in which insulators fail and strongly indorsed the author's conclusions. He stated that in the wet process of producing porcelain the pores cannot be closed by vitification.

R. W. Mastick told of taking 40 or 50 oscillograms of both oil and air-break switches, under load and no-load conditions, at points of switching and at various distances along the transmission line, which showed that the disturbances were not so great nor so sustained with oil as with air break.

J. B. Fisken cited an equal number of tests showing no material difference between the two types of switch. He was still of the opinion that extreme surging is not caused by air switches.

WATER AND LIGHTING INSTALLATION IN SALVADOR.

The town of Moncagua is to be supplied with water by hydraulic power carrying 21,000 gallons in 24 hours a distance of 3900 ft. and to a height of 160 ft. Other towns installing water systems are San Miguel, Ahuaachapan, Usulutan, Sonsonate, and San Juan Nonualco. Electric lighting is being installed in Coatepeque and San Vicente, and acetylene lighting in Metapan and Chalatenango.

The Delegates to the Ninth Annual Convention of The Northwest Electric Light & Power Association and the Pacific Coast

NOTES ON CONVENTION OF N. E. L. & P. ASSOCIATION

The ninth annual convention of the Northwest Elecrtic Light & Power Association at Seattle, Sept. 7-9, 1916, was, in many respects, the most successful yet held. A large attendance and interesting discussion characterized all meetings. The subject of electric ranges, in particular, received much attention. Too much credit cannot be given President E. G. Robinson and his able assistants for the success of the affair.

During the next year the association's activities will be conducted by the following officers, as elected at the close of the session: President, M. C. Osborn, Spokane; Vice-President for Washington, J. S. Thornton, Raymond; Vice-President for Oregon, J. P. Edwards, Tillamook; Vice-President for Idaho, H. B. Waters, Boise. New members executive committee, O. B. Caldwell of Portland and N. W. Brockett of Seattle.

The convention was called to order Wednesday morning by President E. G. Robinson, who introduced Mayor H. C. Gill, who warmly welcomed the power men. After giving fitting response to the welcome President Robinson briefly reviewed the past year's activities. Those who organized the association are still carrying the good work. The affiliation with the National Electric Light Association is proving mutually beneficial and fears of smaller companies have been found to be groundless. He praised the work of the program committee and told of the efforts of the hydroelectric committee on the National Electric Safety Code. He suggested that if the public were properly educated as regards the power companies' side they need have little concern about legislation. He advised the appointment of a permanent secretary and suggested the appointment of a water system committee. The association has 192 members and a balance of $1743 on hand.

The following papers and discussions were presented during the ensuing sessions:

The Employee as the Educator of the Public.

This paper by Arthur Gunn called attention to the value of good will and suggested how it might be cultivated through the aid of the employee. He urged that the principles of loyalty, sincerity, truth, courtesy and tact be deeply impressed on the minds of all who come in contact with the public. He stated that "the customer is always right from his standpoint."

The discussion was opened by Mr. Jennings who emphasized the importance of loyalty. J. P. Edwards laid stress on the necessity for accuracy of statements from employees. F. O. Broili showed that the assumption that the customer is always right may be the cause of some little trouble. E. G. Robinson cited an instance of success in obtaining a contract for street lighting by yielding a point to the public's demands.

H. J. Gille said that instead of preaching these sentiments to salesmen they should be individually developed in accordance therewith. By showing the salesman that such actions benefit him and are the basis for promotion the company will be eventual gainer.

M. C. Osborn pessimistically discounted the suggestions made in the paper and argued that the company who can deliver the most for the least money has the best friends. He stated that these attempts to conciliate the public cost more than it is worth. He believed that by teaching the public to read their own meters and reducing the cost of current the public will be better satisfied.

S. M. Kennedy disagreed with Mr. Osborn's sentiments. He showed that proper consideration of complaints puts the consumer into a better frame of mind. He held to the theory that each employee is a source of either weakness or strength to the company, with

Pacific Coast Convention of the American Institute of Electrical Engineers, Seattle, Washington—September 4 to 9, 1916.

no half-way ground. The employee who is loyal and courteous to be the one advanced. He believed in taking the employee into the confidence of the management so that he may work intelligently.

Arthur Gunn, in closing the discussion, stated that the thoughts in the paper might be materialized by the exercise of care in the selection of the raw material, by systematic record and comparison of complaints and by treating the new business department as a service department.

Adequate Protection Against the Risks of Obsolescence and Inadequacy.

Leslie Craven here showed obsolescence and inadequacy to be forms of functional depreciation caused by the phenomenally rapid changes in the electrical art, as well as by the growth of cities and improvements required by governmental authority. Functional depreciation is similar to the risk from fire and its dangers have so far been mitigated only increase in value of lands and real estate, "a speculative contingency upon which conservative management cannot rely as a substitute for replacement funds to maintain the integrity of the investment." Rates should be such as to include the accumulation of a sufficient fund to replace the property at the end of its life.

Those entering into the discussion of this excellent paper included Henry Gray, W. R. Phipps, S. M. Kennedy, A. S. Moody, O. B. Coldwell, M. C. Osborn and Leslie Craven. The main point developed was the necessity for statistical records as a basis for estimating functional depreciation, concerning which little is known. The initiative should be taken by the companies and not left to the commissions. There are so many variables that each case should be considered separately, especially as apparatus obsolete for one service may be valuable as a stand-by. A sympathetic understanding of these facts is essential to the success of utility regulation.

The question was here introduced as to what account the cost of concreting pole-butts should be charged. The concensus of opinion was that as this prolongs the life of equipment in service, the expense should be capitalized.

Address by S. M. Kennedy.

S. M. Kennedy of Los Angeles, as the representative of President Wagner of the National Electric Light Association, extended greetings and expressed desire for close co-operation between the national and territorial organizations. He characterized the Northwest Association as the most progressive body in the country as evidenced by the local electric range committee's report being adopted by the national body.

He then briefly explained the situation at Los Angeles where the city had sought to obtain the distributing system of the Southern California Edison Company. As this would leave the company without a load for its generating equipment, any valuation should include an item for severance damage. This principle was recognized in the California Railroad Commission's decision, though the amount allowed was cut one-tenth that claimed by the company. The value set on physical property is practically the same as that claimed by the company. The going value claim was not allowed. Including expenditures since July 1, 1915, the total valuation is nearly seven million dollars. As the bond issue for the Los Angeles municipal distributing system is considerably short of the amount Mr. Kennedy felt that "the Southern California Edison Company will be in business for many years to come."

Overhead Line Construction Rules.

M. T. Crawford briefly discussed the principles involved and the results obtained with rules covering the details of overhead line construction. He suggested that safety would be better promoted if the rules were used in an advisory manner, not being given enforced application to widely varying conditions, and if the laws should be enforced to fixing liability and financial responsibility. The objectionable features of the Washington Public Service Commission rules were pointed out, especially the retroactive requirements for reconstruction. The rules increase construction costs from 10 to 20 per cent for city lines and from 10 to 15 per cent for rural lines. Special stress was laid on the hardships involved in trying to comply first with city ordinances, later with state rules and probably in the future with the National Safety Code. The uncertainty in regard to the permanence of rules for line construction is decidedly objectionable.

Discussion was concerned solely with the proposed National Electric Safety Code. L. T. Merwin stated that the Bureau of Standards' suggestions would undoubtedly be adopted by the various state and city commissions and give assurance of less tampering and fewer changes than in the past. They have the approval of labor organizations. N. W. Brockett made a strong plea for home-rule in such matters and urged that the making of rules for local application be left to local authorities. He pointed out the evils of extending national bureaucratic control over local affairs.

J. B. Fisken pointed out the improvement in the revised code and showed that its adoption would help the utilities, its clearness of specification and provisions for zone division promising to save the utilities thousands of dollars. The rules are not retroactive and disputes can be referred to the U. S. Bureau of Standards as a board of arbitration which has proved eminently fair in the past.

Others entering into the general discussion included J. D. Scott, F. D. Weber, F. O. Broili, P. A. Bertrand and M. T. Crawford.

Electrical Operating and Merchandizing in Small Towns.

Lewis A. McArthur and C. R. Young explained the organization of sixteen branch offices of the Pacific Power & Light Company through Oregon, Washington and Idaho. The plan is to have a capable man in each town and to give him considerable authority. Store ledgers, time tickets, payrolls, meter readings, collections, petty supplies and consumers' ledgers, are all handled at the local offices, with monthly summaries rendered the Portland office. All bills are addressed from a central office, outlook envelopes being used. Audits are frequent. Competitive prize awards are made for the best dressed store windows, best reductions in delinquents outstanding and the smallest comparative store accounts. Merchandising is preferably done by salesmen, with special emphasis on concentrated campaigns and demonstrations.

John F. Farquhar explained the situation as regards the Washington Water Power Company, which carries on a general wiring, appliance and motor business in all its suburban properties. Specialty salesmen are used. Traveling auditors take inventories of stock twice a year. Stock turnover is made three times annually. Range campaigns have been aggressively conducted.

The discussion took the form of questions which were answered by L. A. McArthur. Postcard bill forms were suggested as being effective. Standardization of sizes as well as of form of office stationery,

etc., was advocated. Petty cash payments are left to the discretion of the local manager.

Public Policy Committee Report.

N. W. Brockett outlined the accomplishments of the public policy committee during the past year. He told of the successful publicity campaign against the "home rule" initiative bill and explained the good points of seven bills passed by the legislature but held up by referendum. As the seven bills will probably be voted on as a whole he urged the support of power companies. They provide that all initiative and recall petitions must be signed at the registration office, an orderly method of direct primary, anti-picketing, enlargement of the Seattle Port Commission, a budget law, property qualification for voters at bond elections, and a certificate of public necessity and convenience for a power company proposing to enter a field already being served. The last named bill was explained in detail and its advantages strongly urged.

As regards new legislation it was suggested as desirable that there should be an extension of time in the requirement for reconstruction of old distributing lines, that jitneys be put under commission regulation and made to assume the responsibilities of a common carrier and that an indeterminate permit bill be passed.

The Engineer and the Public.

Henry Suzzalo, president of the University of Washington traced engineering from its beginning as a military service to its present more private applications. He emphasized the public character of all professional work and the need for a standard of ethics. Other professions deal with human problems while engineers contend with those of nature which he remodels to meet human needs. Resourcefulness, in the speaker's opinion, should be the chief characteristic of engineers, and for this reason universities give them four times the education they need so that they may meet the constantly increasing demands made upon them. If the engineer does not keep growing he meets professional death. The speaker criticized those who hide their little knowledge and urged an exchange of ideas through technical magazines, conventions and post-graduate courses as the best means for developing growth.

Illumination of P. P. I. E.

W. D'A. Ryan delivered an interesting lecture, illustrated by lantern slides, regarding the illumination of the Panama-Pacific International Exposition.

Dr. E. Lester Jones, superintendent of the U. S. Coast and Geodetic Survey, illustrated and described the methods whereby that organiztaion is accomplishing its remarkable results.

A Greater Jovianism.

A. H. Halloran of San Francisco showed the greater Jovianism to be one that is carrying out the task of localizing activity through the means of leagues in individual cities. He showed how the Jovians are a strong factor in bettering public relations and in carrying out the details of such campaigns as are planned by the Society for Electrical Development.

In this connection was explained the heavy sales drive that is to be conducted during America's Electrical Week, December 2-9. The association indorsed the campaigns for the week and pledged its support to the Society.

Voltage Standardization.

M. D. Cooper of the engineering department National Lamp Works of General Electric Company, showed the benefits of limitation of distributing voltages to a few definite figures. Lamps, heating utensils, etc., could thus be manufactured and distributed at less cost and with greater rapidity. The voltage advocated are 110, 115 and 120 because of their symmetry and because they represent the practice of most central stations.

Electric Range Report.

This report by W. R. Putnam, M. C. Osborn, H. J. Gille, A. C. McMicken, S. V. Walton and S. M. Kennedy, supplemented that presented at the Chicago N. E. L. A. meeting. It treated specifically of advertising, merchandising and water heating. Manufacturers have agreed to devote 60 per cent of their space to general advertising of the advantages of electric cooking and the balance to their own make of range. The Society for Electrical Development is co-operating actively. During the present exploitation period of the range stress should be laid on service selling. As practically all ranges are being sold by central stations they should receive the lowest discounts from the manufacturers. No definite conclusion was reached as to whether the open or enclosed unit is preferable. Many tests have been made but no definite recommendations yet regarding the best method of heating water electrically.

S. M. Kennedy considered the merchandising problem under the head of buying and of selling. Ranges are available from different manufacturers to meet all kinds of demands. The most popular type seems to be one having four burners—800, 1000, 1200 and 1500 watt units—on top of the stove and either a 2-burner oven or preferably two ovens, one for broiling and one for baking. The great requirement is to have sufficient heat quickly. The necessity of keeping down the burner capacity no longer exists, either from the consumer's nor the central station's standpoint. Low price is essential. He entered a strong protest against the license committee's giving a preferential price to the jobber who does not do the development work. This was later followed by a telegram to the committee to the same effect. This objection does not apply to lamp socket appliances, which have already passed the exploitation stage.

To sell ranges the public must be educated by means of advertising, demonstration, personal solicitations and follow-up after purchase. No one of these is sufficient without the others. Advertising should be intelligent; show-rooms are important factors in demonstration, salesmen should be range specialists; follow-up should be thorough.

S. V. Walton told of tests on water heaters made by the Pacific Gas & Electric Company. Many types heat water satisfactorily, but a low rate is essential. At present rates of $3.50 per kw. this business is not entirely profitable. Immersion heaters showed less radiation loss than circulation types.

The Pacific Gas & Electric Company has sold 160 ranges and 66 water heaters in their non-gas territory by means of special salesmen and lady demonstrators, at an average sales cost of $25 per range. In all their territory 225 ranges have been sold. The Great Western Power Company sold 473 ranges and 162 water heaters during the past year. At a three cent rate bills average one dollar per person in a family.

Mr. Derge of Salt Lake City told of selling 650 ranges, four-fifths of which was during a concentrated campaign between April 1 and Sept. 1. The most popular ranges are those selling between $50 and $65 and consuming between 3500 and 4500 watts.

A. C. McMicken recited the success met with

apartment houses installations. Demonstrators follow up all sales to insure satisfaction and intelligent use. Sales expenses averaged 55 per stove, including delivery.

H. J. Gille read the conclusions of the advertising committee's report as submitted to the Chicago convention. Manufacturers have agreed to feature ranges during America's Electrical Week. He felt that the central stations are weak in advertising and especially in need of proper literature.

M. C. Osborn showed that rates for electric cooking varied from 2c per kw.-hr. at Seattle, to 3½c at Los Angeles, where the Southern California Edison Company has sold 1100 ranges this year. That salesmanship is the deciding factor in range sales, rather than rates, is shown by the fact that municipal plants have sold far fewer ranges than central stations. In Spokane 292 ranges and 102 water heaters have been sold. It costs from $60 to $75 to sell and set a range. The consumption averages 129 kw. per range per month.

Mr. Lemmon of Reno has found that 93 per cent of his sales were of the highest price range handled. An electric water heater causes a range to be used more throughout the winter months.

Representatives of various manufacturers produced facts to show that ranges have a diversity factor of 8, that 99 per cent of ranges placed in kitchens stay, consequently that small initial payments are preferable and that even without advertising the demand far exceeded the supply.

Considerable discussion was had regarding the merits of different kinds of boiler insulation, the concensus of opinion seeming to be that the convenience of a laced covering of hair felt being the handiest though not the most efficient. Other insulating materials suggested included pulverized gas coke, sawdust, asbestos and magnesia. It is as important to lag the pipes as the boilers, particularly in circulating systems.

Considerable discussion has attended the use of baffles, though care must be exercised to see that check valve is provided to prevent possibility of boiler explosion.

In general, for water heating as for cooking, quick service was shown to be more essential than limiting the maximum demand. The great diversity of the load will prevent transformers being overworked.

Entertainment Features.

The entertainment by both the Northwest Light & Power Association and the American Institute of Electrical Engineers was conjoined in a most enjoyable fashion. The ladies were given automobile trips and a theater party and the men had a banquet on Friday evening at the New Washington Hotel. N. W. Brockett presided at the latter, introducing as speakers President-elect M. C. Osborn, Dr. Frederick Bedell, S. M. Kennedy, Henry L. Gray, Ralph W. Pope and R. W. Clark.

On Saturday, the ninth, a steam trip was taken around Lake Washington and luncheon served at Fortuna Park, where dancing and sports were indulged in, thus bringing to a pleasant close a most successful convention.

WATER POWER IN SOUTHEASTERN ALASKA.

The streams of Alaska have been important factors in its industrial growth. The success of placer mining in northern and central Alaska has depended primarily on the water available for hydraulicking and dredging, and in southeastern Alaska water power has long been used by mines, canneries, sawmills, and other industries, although until recently most of the plants have been small.

Since 1906 the United States Geological Survey, Department of the Interior, has been making systematic studies of the water resources of Alaska. Lack of definite information in regard to the quantity of water available and other physical factors that determine the feasibility of a power site has been one of the principal impediments to development. For this reason a systematic investigation designed to determine the location of feasible waterpower sites in southeastern Alaska was undertaken by the Geological Survey in co-operation with the Forest Service in the spring of 1915.

As an outcome of this later study a report, prepared by G. H. Canfield, entitled "Waterpower Investigations in Southeastern Alaska," has been recently published by the Geological Survey as part of Bulletin 642. In this bulletin the data collected at gaging stations in southeastern Alaska are given, as well as a general description of each station and tables showing the results of discharge measurements and the computed daily discharge.

A copy of the report, which is included in Bulletin 642-B, may be obtained from the Director of the Geological Survey at Washington, D. C.

PHOTOGRAPHING INTERIOR STRUCTURE OF CONCRETE WORK.

Some successful experiments in photographing the iron reinforcements of concrete work with Roentgen rays, recently made by Inspecting Engineer E. Stettler of the Swiss Railway Department, are attracting much attention among Swiss construction engineers. The advantages of being able to make an examination of the condition of such reinforcements or the proper disposition and situation thereof without destroying the concrete structure are self-evident, as well as the desirability of being able to make an inspection of the position of the reinforcing iron rods upon the completion of the cement parts of a new building or a new cement structure.

Engineer Stettler, by the use of special plates adapted to any construction, has apparently obtained serviceable pictures of the inner structure of cement blocks. To eyes accustomed to pictures with great detail and much light and shadow, the first results of the Roentgen exposure may seem somewhat meager However, the iron reinforcements in the pictures are shown in their proper size and situation, as also the connections and crossings, so that the imperfect connections can be clearly recognized.

SPARKS—CURRENT FACTS, FIGURES AND FANCY

"What sugar is doing for Cuba" is emphatically shown by the fact that her net profit from this source during the past two years is said to be one quarter of a billion dollars.

* * *

An eastern electric railway signal system has been developed to such a high stage of perfection that only one interruption is recorded to every thirty-seven thousand signal movements.

* * *

At last a good word has been said for American exporters. The London Ironmonger highly praises the superior condition in which American-made pipe recently arrived on the job in Egypt.

* * *

Even the far off Canary Islands are feeling the high advance in prices. The cost of manila paper for the packing of their fruits has advanced thirty-three and one-third per cent since the first of the year.

* * *

It is doubtful whether the recent threatened railroad strike would have proven more disastrous to this country than to the allies who are drawing much of their food stuffs and a vast amount of ammunition and guns from our factories.

* * *

Open air electric railway cars, devoid of roofing are proving popular in Vancouver, B. C. This is the first instance to be noted wherein the conveniences of modern automobile travel are beginning to be met by street railway car design.

* * *

The official report of the Argentine government shows that governmental loan advances to farmers have proved a great success. The fears as to the repayment of the advances made against the security of pledges have proved groundless.

* * *

The Japanese government, having on deposit some fifty millions of dollars in this country for which it receives but one and one-half per cent per annum is about to invest this sum in British treasury bills that yield at present between four or five per cent.

* * *

The Chilean government is advancing vast financial assistance to its nitrate producers. The American government would do well to subsidize in some manner those who would venture into hydroelectric fixation of atmospheric nitrogen at this critical stage of unpreparedness.

* * *

Shipyards the world over are working night and day trying to supply the demand for commercial ships, yet prices for vessels continue to mount to new high records. Preparedness for peace by having a well organized merchant marine is now uppermost in American minds.

The great demand for tungsten has recently led to an extremely energetic development of the tungsten deposits 8 miles west of Bishop, Inyo County, California. The deposits were discovered in 1913, but remained practically unknown until the spring of 1916.

* * *

Reports from loan brokers say that many investors are looking forward to the end of the war and are seeking to invest their money in farm mortgages as a sound security that will not be affected by the readjustment in industrial affairs that is likely to follow peace. This is accounting for the surplus of money offered to brokers, now much larger than loans can be furnished.

* * *

If variety has anything to do with the spice of life as heralded in the ancient proverb, San Francisco's recent bridge hearing certainly proved interesting to the fullest extent. Estimated costs ranged from eleven million dollars to seventy-five million dollars,depending upon the particular design advocated, while cantilevers spanning to Goat Island, tunnels and pontoons added variety in suggestive design.

* * *

The Republic of France, though torn by war, is nevertheless planning a gigantic International Sample Fair for two weeks in March, 1917, to be held at Lyon. A vast system of publicity has been organized throughout the world in order to attract a great throng of buyers. Dealers are strictly forbidden, however, to deliver any article during the period of the fair or to sell any article of goods at retail.

* * *

The Electrical World congratulates San Francisco in a recent editorial upon the three conspicuous things in her beautiful new lighting system. First upon the color tone which is a golden glow instead of the somewhat hard white usually found. Second, upon the free use of arcs in groups upon standards or single units. And third, upon the utilization of railway poles, thus lessening the number of standards in the streets and adding to its decorative possibilities.

* * *

A discovery which may greatly increase the output of pineapples in the Hawaiian Islands has been announced by M. O. Johnson, chemist of the United States experiment station in Honolulu. He has developed a method of neutralizing the action of manganese on pineapples grown on soils heavily impregnated with this mineral. An area variously estimated at 6000 to 10,000 acres on this island has black-top soils which are impregnated with manganese in proportions up to 2 or 3 per cent of the weight per acre-foot. When pineapples are planted on these soils they grow well for a time, but as the harvest time approaches the leaves drop and become yellow. The fruit usually forms, but does not develop properly, and it ripens before attaining full maturity, or, on the worst lands, fruit hardly forms at all.

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NOTICE TO ADVERTISERS.

Change of advertising copy should reach this office ten days in advance of date of issue. New advertisements will be accepted up to noon Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advance of date of issue.

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Why Have an Electric Parade?

To the careful student of modern electrical evolution, two live campaigns in the uses of electrical energy are seen to be the talk and discussion of the hour—namely, the effort to enlarge the use of electric appliances in the home with especial emphasis upon cooking by wire, and the utilization of street lighting to a higher and broader expression in modern business activity.

It is to assist this latter activity that a few words are well in order at this period. A gigantic effort is being made to make America's Electrical week in December an affair long to be recalled in the memories of a nation now possessing over a hundred millions in population. As a typical example of the enormity of publicity that is now being prepared to arouse interest in this undertaking it is estimated that the official poster for America's electrical week will be reproduced over two hundred million times before the period it heralds arrives upon the scene.

The question naturally arises in one's mind "why such enormity of electrical publicity?" The answer comes at once that the average human being, though unfamiliar with the intricate laws and workings of electricity is nevertheless profoundly impressed with its present uses and its future possibilities. Indeed we must all admit the harnessing of the subtle force which drives the lightning bolt or propels intelligence through boundless space without the use of wires expresses more the all-sweeping power of the Almighty himself rather than any possible creation of human hands. It is this strong appeal to the imagination that grips the observer on all sides.

Coming now to the lighting campaigns that are being waged in various cities of the West, we find that this same strong appeal is moving peoples and communities alike. The great rainbow spray of the Panama-Pacific Exposition will long live in the minds of all who beheld its tantalizing splendor. And again a community that bedecks itself in the very latest lighting effects in its business district will leave the same impression upon all beholders.

Finally, then, to clinch the impression in the public mind after a community has completed an installation of marked beauty and merit in electric lighting, the electrical parade, featuring the history and evolution of light from the early dawn of civilization to its present advanced state, makes an imprint upon the public mind so impressive and so all sweeping in its effect that every beholder becomes a booster for the city or community wherein it is held.

From the commercial point of view the electrical parade has overwhelming arguments in its favor for aiding immeasurably in boosting the sales and uses of electrical energy. The inventor beholding it, is led to dream even greater possibilities of electrical application. The general public beholding its beauty become imbued with a keen desire to use more and install more electrical lighting features. The jobber, the contractor, the central station man and the manufacturer, all beholding it realize more and more the possibilities of co-operation in extending the bounds of an ever increasing industry.

The final result is that the electrical parade, well planned and well executed, has features of value to

the development of electrical application and uses not to be equalled in any other single line of activity.

Real Need in University Extension

Readers of the Journal undoubtedly found much personal interest in following the announcement given in the issue of September 9th concerning university extension effort at the University of California.

It is a great source of gratification to taxpayers of the West and indeed to all her well-wishers that the various common-wealths of the Pacific Coast are through their state universities offering opportunities of study by means of extension and correspondence courses that a decade ago were not dreamed of as being possible.

Today literally thousands of young men and women, though deprived of the privilege of attendance at the various state universities are enabled to vastly improve their time by enrolling in some one or more courses in agriculture, languages, literature, public speaking, mathematics, political science, business branches, economics and technology.

Indeed to such an extent has this helping hand been extended that now a farmer producing apples in the snow-capped districts of Montana and Idaho, grapes or alfalfa in the great central basins of Oregon and California, or citrus fruits upon the deserts to the south, knows where he can always find a friend that will assist him to better himself or to solve his problems.

There is, however, one phase of university extension which is sorely needed in the West that to date has been absolutely allowed to pass unnoticed and unnurtured—namely that of assisting the "near engineers" or technical men employed in the industries who are ambitious to better themselves but who find it impossible to devote resident study at the state university.

For instance California today has the most extensive hydroelectric systems in the world. Her production of crude petroleum has passed twenty-five per cent of the entire world's output. Her steam auxiliary central stations are the best examples of efficiency in fuel oil burning to be found in the art. Yet the study of hydraulics, surveying or fuel oil practice is not available through university extension to men engaged in this work. Montana, Idaho and Arizona are today producing in mineral activity records in copper and other ores hitherto unexceeded, yet no opportunity is offered in non-resident study for men engaged in this work to study mine timbering, mine economy or indeed any line of work allied with mining engineering.

It is gratifying to note that announcement has just been made that courses to assist the carpenter, lineman and power plant operator have just been announced by one of our western state universities.

But the work should go further. Other subjects should be included, such as a study of the practical points of industrial installations, the timbering and operation of mines, the laying of foundations, pointers on power plant economy, and indeed all those parts of the engineering curricula which could be set forth with the idea of helping those engaged in this work to the highest degree possible. This work could be carefully graded to meet all conditions and types of men that desire it and need it badly. There are many men today proficient in higher mathematical knowledge who can well follow the most intricate mathematical reasoning of the college engineering course, yet who are unable to make university residence to pursue further study.

It is argued that university residence is the only possible way to pursue an engineering course, hence such subjects as those just mentioned which are the crying need of thousands in the West must be reserved for the study of the favored few who can attend the university. Such a hard and fast delineation of university effort will not as a matter of fact stand the test of close scrutiny. It is already being accomplished in certain eastern centers.

The time is coming and it is not far distant either when the public will itself demand that the spaciously equipped laboratories of western universities be opened, in so far as may be possible, for special class instruction and laboratory exercise to meet the needs of the thousands who are hungering and longing for a helping hand along these directions. That it is impossible for a non-resident man to acquire the highly technicalized standing to be attained by the four or five year resident engineering student is not to be denied. On the other hand, that countless good can be accomplished and that the regular engineering standards of the university can be jealously guarded under properly devised standards of university engineering extension is, too, already an established fact.

We must all admit that fundamentally the conception of a seat of learning is not only to find the truth but to spread the gospel of truth to every quarter possible. Let the engineering faculties of western universities think more seriously over this problem. It is right that they should aim to maintain and equip engineering schools of the highest standard. On the other hand a high sense of duty to the public should urge them, while raising the standards upward, to work downward in spreading the truth to the less fortunate. Indeed by careful thought and planning there should be no hiatus in the acquirement of engineering learning. Throughout the length and breadth of the commonwealth any citizen desirous of improving his opportunities should, if unable to secure the work in local institutions, be able to appeal to the university and receive kindly encouraging help, and not that icy help which says to the young man "some day if you can pass our qualifications in trigonometry, languages and other set points, we will allow you to pursue your course at the university and after four or five years hard resident study grant you an engineering degree. Meanwhile though you could perfect yourself through correspondence in boiler operation, fuel oil burning, hydraulics, surveying and a host of other subjects we teach, still to allow you to do this in part might decrease interest in our regular courses or lower our standard."

Our state universities are the fountains of learning from which all should be allowed to drink. And no bar or set standard in extension work should be maintained in any of its branches except the ability of the student himself to pursue the work he so greatly desires to undertake.

PERSONALS

W. S. Greenfield, district manager H. W. Johns-Manville Company, of San Francisco, is at San Diego.

W. H. Holabird, an electrical engineer of Los Angeles, is stopping at the Palace Hotel, in San Francisco.

C. C. Hillis, general manager of the Electrical Appliance Company, San Francisco, is on an extended Eastern trip.

L. E. Sperry, sales agent for the New York Insulated Wire Company, is at Salt Lake for a two weeks' outing.

A. F. Dickerson, of the General Electric Company, has just returned from a business trip through the Northwest.

Jos. Sachs, inventor of the Noark Indicating Fuse, from Hartford, Connecticut, is at the Palace Hotel, San Francisco.

W. R. Mongerson, of the firm of Mongerson Electrical Machine Works of Bakersfield, California, is here on a short visit.

T. E. Bibbins, president of the Pacific States Electric Company, is making a business trip throughout the Northwest.

E. M. Cutting, Pacific Coast manager Edison Storage Battery Company, has returned to San Francisco from a trip through Oregon and Washington.

E. Ellis, assistant purchasing agent San Joaquin Light & Power Company, Fresno, stopped at San Francisco for a day on his way home from his vacation.

Arnold Pfau, hydroelectric engineer with the Allis-Chalmers Company, arrived in San Francisco Monday. He expects to make an extended visit on the Coast.

H. B. Squires of the H. B. Squires Company, San Francisco, is away on a pleasure trip to Squaw Camp, Oregon, where he expects to be for the balance of the month.

C. V. Kennedy, formerly of the Los Angeles office of the Pacific Light & Power Corporation, has been made manager of the Oxnard office of the Ventura Power Company.

R. M. Gilson, manager of the Oakland branch of the Pacific States Electric Company, has resigned from that company to enter business with his brother in Oakland.

S. P. Russell, sales manager San Francisco branch of the H. W. Johns-Manville Company, has just returned from a two weeks' business trip throughout Southern California.

C. R. Duncan, formerly manager of the Oxnard office of the Ventura Power Company, has been transferred to the Big Creek plant of the Pacific Light & Power Corporation.

Donald K. Lippincott of the Rieber Laboratories, San Francisco, has been laid up at the hospital with a slight attack of appendicitis. His conditions is reported as much improved.

H. M. Byllesby, president; **J. J. O'Brien,** vice-president, and **W. R. Thompson,** chief engineer of H. M. Byllesby & Co., spent the past two weeks inspecting the company's Pacific Coast properties.

Albert H. Elliott, attorney for the California Association of Electrical Contractors & Dealers, is attending the annual convention of the Washington State Association of Electrical Contractors at Seattle.

H. B. Waters, salesmanager for the Electrical Investment Company of Boise, Idaho, was recently in Jordan Valley, Oregon, looking over the feasibility of extending his company's lines from De Lamar to Jordan Valley.

Chas. H. Carter, for many years associated with the Pacific States Electric Company, both at Los Angeles and San Francisco, has severed his connections with the company and expects soon to go in business for himself.

Frank J. Somers of San Jose and president of the California Association of Electrical Contractors & Jobbers, is representing the California Association at the annual convention of the Washington Contractors' Association.

Henry L. Doherty, president of Henry L. Doherty & Company, of New York, and also president of the Society for Electrical Development, Inc., has announced himself as candidate for the office of the next Fifteenth Jupiter of the Jovian Order. The Jovian Order now number approximately 20,000 members, with 75 local leagues. The present Jupiter, the fourteenth, is Thamos A. Wynne, of Indianapolis, Ind.

W. L. Goodwin, vice-president Pacific States Electric Company, met with a painful accident last Thursday evening while changing the tire of his automobile. Through an oversight the tire had been removed without releasing the air. As soon as the ring was released, the tire exploded, the ring cutting his hand and face severely. He was taken to the Emergency Hospital and later removed to his home. From last reports he was improving very rapidly.

C. E. Groesbeck, general manager of the Utah Power & Light Company, announces that for the present the duties of manager of the Salt Lake division of the company will be combined with those of the general sales manager of the company that **W. R .Putman,** the present general sales manager will assume responsibility of the combined position. Mr. Putman has been with the Utah Power & Light Company in this capacity for the past two and one-half years prior to which time he was connected with various properties in Minnesota and the Dakotas.

D. C. Green, for the past year and a half manager of the Salt Lake division of the Utah Power & Light Company, has resigned his position to accept one as general manager of the Fort Smith Light & Traction Company of Fort Smith, Arkansas. This property is operated by the H. M. Byllesby Company of Chicago. This property furnishes the electric, gas and street railway service of Fort Smith and operates an interurban line between Fort Smith and Van Buren. Before taking his position with the Utah Power & Light Company, Mr. Green had been connected with the Byllesby Company for several years at San Diego, California; Albany, Oregon; Marshfield, Oregon; and Everett, Washington. He graduated from Purdue University in electrical engineering in 1908.

MEETING NOTICES.

The Tenth Annual Convention of the Illuminating Engineering Society of which Dr. C. P. Steinmetz is president, will be held in Philadelphia, Pa., September 18, 19 and 20, 1916, at the Bellevue-Stratford Hotel. Probably no city in the Union could have been chosen to more fittingly celebrate the tenth milestone in the progress of the Society than Philadelphia, which stands pre-eminent in gas and electrical annals. It is interesting to know that the first gas light in America was exhibited in this city in 1796, and Philadelphia was one of the early cities to adopt gas for public street lighting.

Electrical Development and Jovian League.

After a two months' vacation period the first meeting of the fall term was held September 6, 1916. Report of the Preparedness Parade Committee was accepted and placed on file and the committee discharged with a vote of thanks. Letter of acknowledgment from the Los Angeles Jovian League of the resolution passed by the San Francisco Jovians on the death of Mr. J. Harry Pieper was read and ordered placed on file. Mr. Thomas Collins made report for the committee on the Path of Gold Festival, Oct. 4-5, 1916. The business of the meeting being disposed of, Acting President A. M. Alvord turned the meeting over to the chairman of the day, Mr. Henry Bostwick who introduced the speaker, Mr. J. S. Utley, director of the Morris Plan Co. of San Francisco. Mr. Utley explained the objects and purposes of the Morris plan of lending financial assistance to employers and employes, who, by unfortunate combinations of conditions beyond their control were in need of help. One of the main objects of the plan being to keep such persons out of the hands of "loan sharks" with their high rates of interest. Many instances were cited

of the helpfulness of the method in the cities of New York, Philadelphia, Chicago, etc., where it has been in operation for some time.

SAN MATEO CONTRACTORS ORGANIZE.

Some sixteen San Francisco members of the California Association of Electrical Contractors and Dealers paid a flying visit to San Mateo Wednesday evening, September 6th, and assisted the electrical contractors of San Mateo County in the formation of a local branch of the state association for the county. The meeting proved to be a most enthusiastic one, addresses being made by many of the visiting members and local men. From all appearances San Mateo County contractors start out under most favorable conditions.

GENERAL PLANS FOR AMERICA'S ELECTRICAL WEEK.

From December 2 to December 9 all divisions of the electrical industry will combine to make America's Electrical Week the biggest business-getting sales campaign this country has ever experienced.

By means of national magazine, trade paper and newspaper advertising, by means of street car cards, window lithographs, billboards and poster stamps, the "Do It Electrically" message will be carried into every corner of the United States.

Illuminations, parades and electrical shows will command the attention of everybody during the week.

Municipalities will stage great pageants. Individual firms will make their windows and stores so attractive that the casual passer-by will stop, look, buy and become a permanent customer.

Electricity will be the one big topic of conversation during America's Electrical Week—for weeks before and long after. Coming as it does at the beginning of the holiday season a most obvious result will be that people will spend their Christmas money for electrical gifts.

Call it a "campaign," a "big drive," a "united effort"—or just a "week"—it is absolutely certain that this concerted effort by electrical men must result in gratifying returns in business in sales. So, if a "week" of this sort really sells more goods, means more wiring business, more meters connected—and Electrical Prosperity Week last year proved that it does—let's all get behind America's Electrical Week this year and get our share of the profits.

The Name.

The name "America's Electric Week" has been happily chosen. Never before has there been a period in our national life when Americanism has meant more. The industries of America are contending with one another to see which shall do most for the country's good.

The electrical industry can and will take a place of leadership in this broader movement for industrial preparedness commensurate with its position in the forefront of modern progress.

A Start Has Been Made.

Already a big step has been taken toward the goal set for this year's week. Realizing that the design for the week, poster, which will carry the story of A. E. W. into millions of homes, is of the utmost importance, the A. E. W. Executive Committee decided that the surest way to secure a worthy design was to draw upon the ideas of the best artists of the nation.

Consequently a National Electrical Poster Competition has been held as a result of which over 800 posters were submitted. The prize-winning design, which is reproduced on the cover, has been selected by the judges as being not only the best poster from an artistic point of view, but also as best suited to express the purposes of America's Electrical Week. This poster is the official design for the week and will be reproduced millions of times. Throughout the entire country, on everything from poster stamp to poster board, this modern Aladdin will be found summoning the genii, "Electricity," to do his bidding.

The original drawings have been exhibited in New York, at the convention of the Associated Advertising Clubs of the World in Philadelphia, at the Poster Advertising Association convention in Atlantic City, in Chicago, Milwaukee and New Orleans. They will be shown in Cleveland, Pittsburg, Buffalo, Cincinnati, Boston and many other large cities before the week arrives.

TRADE NOTES.

The Edison Storage Battery Supply Company announces that on account of its growing business and insufficient room at 441 Golden Gate avenue, it has secured the entire three floors and basement of building at 206-8-10 First street (near Howard), San Francisco, which it will occupy immediately as office, supply depot and service station.

The Electric Agencies Company, formerly of No. 247 Minna street, San Francisco, has removed to No. 279-283 Minna street, where new and commodious quarters enables the company to handle increasing business with even greater expediency than formerly. Their Los Angeles address has also been changed to No. 419-421 East Third street, former address having been Central building.

Allis-Chalmers Manufacturing Company of San Francisco report recent sales: 5000 kw. alternator, Pacific Light & Power Company of Los Angeles, for their new development near Bishop. Two 500 h.p. motors for Reclamation Service No. 999; 180 h.p. Diesel engine to Sanderson & Porter for the Yarhola Pipe Line Company; 180 h.p. Diesel engine to the Olympic Mines Company, Miner, Nevada.

M. C. Baker & Sons, who have been established in this city for over thirty years, announce that they have recently gone into the technical and practical end in the development of all kinds of model and experimental work, both mechanical and electrical. This company has developed various models, such as quick detachable automobile tire rims and wheels, also electric indicating device for registration of the capacity of the big oil tanks throughout the state, and are now specializing in all classes of electrical devices along the experimental lines.

NEW CATALOGUES AND BULLETINS.

Industrial heating appliances as manufactured by the Westinghouse Electric & Manufacturing Company, are described and illustrated in leaflet No. 3918 just issued by this company. A brief description and some of the uses are given of each of these different devices.

The effects of Vibration in Structure is a preliminary report of the Aberthaw Construction Company in an exhaustive investigation it has undertaken. The report covers twenty-four pages and will prove of much interest to those troubled with vibration of structures.

Bates Steel Pole Treatise is the title of a fifty-page bulletin just issued by the Bates Expanded Steel Truss Company of Chicago whose western agents are the Electrical Material Company of San Francisco. The bulletin has much useful information for the designing engineer covering the various uses of poles in electric transmission.

A 20,000 kw., 11,000 volt, 25 cycle, turbine unit complete with a 24,000 sq. ft. surface condenser and auxiliaries, has recently been ordered by the Pennsylvania Railroad Company from the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa. This turbine is for installation in the company's Long Island City power house which supplies power for the operation of the Pennsylvania Terminal and the Long Island Railroad.

NEWS NOTES

FINANCIAL.

SALEM, ORE.—The net income or profits of the Northwestern Electric Company of Portland during the year ending June 30, totaled $176,136; operating revenues were $675,593, and operating expenses $237,392, making the operating income $4,383.200.

SALEM, ORE.—The California-Oregon Power Company, operating plants in Southern Oregon cities, sustained a net loss of $157,045 during the year ending June 30, according to the annual report filed with the State Public Service Commission. Operating revenues were $402,444 and operating expenses $328,404. The company had a surplus at the beginning of the year of $29,925 and the deficit at the end of the year was $127,351.

SAN FRANCISCO, CAL.—The Pacific Gas & Electric Company shows an interesting statement of earnings for the twelve months ended July 31, 1916, as follows:

	1916.	1915.	+Increases —Decreases
Gross operating revenue	$18,609,825.21	$17,845,000.61	+$764,824.60
Operating expenses, maintenance, taxes and reserves for casualties, uncollectible accounts and depreciation	10,749.799.87	10,240,751.75	+ 509,048.12
Net operating revenue	$ 7,860,025.34	$ 7,604,248.86	+$255,776.48
Non-operating revenue (net)	472,827.94	340,691.70	+ 132,136.24
Total net income	$ 8,332.853.28	$ 7,994,940.56	+$387,912.72
Bond and note interest	3,900,718.03	4,061,952.52	— 161,234.49
Bond and note discount and expense (apportionment)	171,680.14	292,596.44	— 120,916.30
Surplus	$ 4,260,455.11	$ 3,590,391.60	+$670,063.51
Dividends on preferred stock — accrued for 12 months	1,253,029.79	902,792.01	+ 350.237.78
Balance	$ 3,007,425.32	$ 2,687,599.59	+$319,825.73

INCORPORATIONS.

EVERETT, WASH.—The Washington Coast Utilities Companies capitalized at $100,000 has filed articles of incorporation. The incorporators are Warren Marshall and Shirley S. Philbrick of Boston and Charles E. Shepherd of Seattle. Headquarters will be maintained at Arlington, the company to furnish power to towns and corporations.

SPOKANE, WASH.—A company for the development of a natural gas project near Ephrata in Grant county has been formed with an authorized capitalization of $250,000. Work will be started immediately south of Ephrata. It is planned to sink the shaft to a depth of 1500 ft. at a cost of $30,000. Paul Donaldson, H. P. Brown, Wm. Clapp and Loren Harris are the incorporators.

LA PINE, ORE.—The Prairie Falls Electric Power Company has been incorporated with a capitalization of $500,000. The incorporators are F. W. Tomes, E. L. Clark and A. D. Lee, and arrangements for the installation of the first unit of the plant have been made. This unit will develop 2200 horsepower, and will supply power for irrigation in the La Pine district and furnish electric light for Pringle Falls.

ILLUMINATION.

OROVILLE, CAL.—The city contemplates the establishment of a municipal lighting system.

TULARE, CAL.—The Central California Gas Company has plans underway for installing a lighting system in this city.

PETALUMA, CAL.—At a meeting of taxpayers of the Cinnabar District it was decided to install more lights in the district.

LOS ANGELES, CAL.—An ordinance has been adopted for the ornamental lighting of Adams street from Figueroa street to Hoover street.

SACRAMENTO, CAL.—The supervisors have called an election for September 30th to vote on the formation of the North Sacramento Lighting District.

TACOMA, WASH.—Extensions to the gas plants controlled by H. M. Byllesby & Co., of Chicago, are under consideration for Tacoma, Everett and Olympia.

LOS ANGELES, CAL.—The city council has instructed the preparation of an ordinance for the ornamental lighting of Fifty-fifth street, between Budlong and Normandie avenues.

HUNTINGTON BEACH, CAL.—The board of trustees will receive bids up to September 25th for bonds in the sum of $20,000 for the purpose of constructing a gas distributing system.

PORT ANGELES, WASH.—An issue of city light bonds to the extent of $22,000 to take up warrant indebtedness and provide funds for needed extensions has been practically decided upon by the city council.

CONNELL, WASH.—Mr. Essex, representing the Spokane & Eastern Trust Company of Spokane, has purchased the municipal bonds of the Connell Water & Lighting System. The city assumed charge of the system.

SANTA BARBARA, CAL.—A resolution has been adopted by the city council for the installation of ornamental lights on State street, between Ocean Boulevard and Victoria street. Protests will be heard at the council chamber on September 21st.

NEWPORT, CAL.—At the request of the attorney general a resolution has been passed by the city trustees, giving the board right to seel the remaining gas bonds without advertising. This will legalize the recent sale of three bids to the State Board of Control.

PALO ALTO, CAI The Pacific Gas & Electric Company is building a new pipe line from Redwood City to Palo Alto, According to General Manager Britton, the company is selling gas wholesale to the Palo Alto Gas Company, and the object in building the new line is only to improve the present service,

SEATTLE, WASH.—The following items have been provided in the city budget for the lighting department: Testing machinery, $3200; supplies and materials, $100,000; truck, $5000; overhead wiring, $10,000; underground cables, $70,000; pole lines, transformers, meters, lamps, etc., $275,000; substations, reinforced concrete buildings at Ballard and Fremont, $75,000.

TRANSMISSION.

REDDING, CAL.—The Northern California Power Company is rebuilding the old power line from French Gulch to Balaklala.

REDLANDS, CAL.—The Southern California Edison Company has leased a room in the Fisher Block, to be used for main offices of the company here.

KLAMATH FALLS, ORE.—The privilege of furnishing electricity to patrons in Klamath Falls will be requested of

the council by the Kene Power Company, who will present to the council a petition for a franchise.

MOGOLLON, N. M.—It is understood that the Pelton Water Wheel Company has the contract for the new hydroelectric plant to be installed on Mineral Creek by the Mogollon Power & Lumber Company. If this plant proves successful, other plants will probably be established in the near future.

LOS ANGELES, CAL.—A resolution has been adopted by the council instructing the city attorney to institute proceedings in the superior court for the condemnation of permanent easement and right of way for the purpose of constructing electric power lines over certain lots in the Porter Land & Water Company's subdivision.

BAKERSFIELD, CAL.—The Southern Sierras Power Company has applied to the board of supervisors of Kern county for a franchise to erect and operate for 50 years, an electric pole, tower and wire system for transmitting electricity for heat and power and other purposes upon the public highways in the county. Sealed bids will be received for the franchise up to October 7th.

ARLINGTON, WASH.—The Jim Creek Water, Light & Power Company has been purchased by Warner Marshall of Boston who has also bought the Stanwood Light & Power Company. Stanwood and Arlington are to be joined by 14½ miles of transmission line and the hydroelectric plant at Arlington used to serve both towns. The Stanwood steam plant will be used as a stand-by.

TELEPHONE AND TELEGRAPH.

JUNEAU, ALASKA.—The Marconi Wireless Telegraph Company is to build a wireless station here.

ROUNDUP, MONT.—The Mountain States Telephone & Telegraph Company will construct an exchange here this season.

HELENA, MONT.—The Lame Jones Telephone Company of Plevna has been incorporated for the purpose of building a line from Plevna to Ekalaka via Lame Jones. Amount of incorporation, $5000.

SALINAS, CAL.—The board of supervisors has granted the petition of the Indian Valley Telephone Association to build a telephone line from the San Luis Obispo county line northward along the county road to the junction of Peach Tree road.

KINGMAN, ARIZ.—It has been announced by the manager of the Arizona, California & Nevada Telephone Company, that a tentative agreement has been made with the Mt. States Telephone Company for a joint toll line service. Connection is to be made at Ashfork, thus giving Kingman and Mohave county direct long distance service to all parts of the state, coast or any part of the United States.

IRRIGATION.

ATTALIA, WASH.—Farmers of this district have petitioned the county commissioners to establish an irrigation district.

COEUR D'ALENE, IDAHO.—William Dollar has asked for a franchise to distribute hot water, steam and electric current for light and power.

VALE, ORE.—Bids will be received up to October 2 at 2 p. m. by the directors of the Warm Springs Irrigation District for the purchase of $390,000 in district bonds.

BEND, ORE.—Pringle Fall Electric Company has completed arrangements for the first unit of the power plant which will develop 2200 h.p. to furnish light and power for irrigation for different localities here.

GALT, CAL.—A water takers' association has been organized in the Sheldon District and a committee has been appointed to work with the Herald Water Takers' Association on a plan for the formation of an irrigation district.

SUNNYSIDE, WASH.—The contract for furnishing and erecting wood stave pipe for the Grand View irrigation district has been awarded to the Washington Pipe & Foundry Company of Tacoma at $18,405.70.

SOUTH BEND, WASH.—Eli Rockey of Bay Center and others are forming a diking district near the mouth of the Palix River. The dike will be 1400 ft. in length and will reclaim 1750 acres of land. The Cowlitz Bridge Company has the contract at $60,000 for the work.

MACKAY, IDAHO.—A citizens' committee of this place has been presented with a set of plans by the Utah Construction Company for building the Mackay dam to the height of 65 ft. and with a water line of 55 ft. When the plans have been approved by the state engineer and engineer selected by the citizens of Mackay, work will proceed. This is for the completion of the Big Lost River Carey Act project, and the state land board has given its approval.

MALTA, MONT.—Sealed proposals will be received at this place by the United States Reclamation Service up to September 27th for construction of structures on the Milk River project, involving about 10,000 yd. of excavation, 600 cu. yd. reinforced concrete, 1300 sq. yd. paving, placing of 40,000 lb. reinforcing steel, and installing in wooden structures 134,000 ft. lumber. The work is located in the vicinity of Sace and Beaverton, Mont.

SAN FRANCISCO, CAL.—The Western Development Company of San Francisco has applied to the State Water Commission for permission to appropriate 2½ cubic feet per second of the waters of the South Branch of Oregon House Creek, tributary to Dry Creek in Yuba county, for irrigation purposes. By a dam of timber, rock and brush, applicants intend to divert the water to 90 acres of land at a cost of $500. The works are to be known as the Meadows Lawn Stock Farm Ditch.

SAN FRANCISCO, CAL.—Twenty-six thousand acres in Reclamation District, No. 999, adjoining Ryer Island on the Sacramento River, fourteen miles below Sacramento, are to be leveed and a drainage system installed by a big corporation owning 40,000 acres of delta land in San Joaquin and Contra Costa counties. The drainage will include the installation of pumps and the building of ditches, and will cost $600,000. Ten huge dredges and two ditching machines will be utilized in the work, which will require two years to complete.

NORTH YAKIMA, WASH.—The following awards have been made by the reclamation service for furnishing power and plumbing equipment for the Grand View irrigation district, Yakima project, under bids opened June 15. Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., $5900 for electrical apparatus; Pittsburg Transformer Company, Pittsburgh, Pa., $1152 for transformers; Trump Manufacturing Company, Springfield, Ohio, $3250 for hydraulic apparatus; S. Morgan Smith Company, York, Pa., $10,230 for direct pumping unit; The Western Pipe & Steel Company, San Francisco, California, $2713 for riveted steel pipe; Vulcan Iron Works, Denver, Colo., $420 for cast iron head gates; Judson Manufacturing Company, San Francisco, Cal., $397 for trash racks, etc.

PARADISE, CAL.—The board of directors of the Paradise irrigation district at the next meeting will be asked to approve the following plan of work: Building of a dam at Magalia to store 80 ft. of water, and building of the first unit of the distributing system to water all land now planted in the district and new plantings to total 3000 acres. It is estimated this will suffice for the next five years, at the end of which time— or sooner if required—the second unit of the distributing system will be built, covering an additional 3000 acres. When a total of 6000 acres are taking water the third unit of the distributing system will be built and the dam at Magalia raised to the 125 ft. depth of stored water.

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	Metal Mouding and Fittings—Each.	List.	Sell.
333	Moulding (Based Capping Comp.)	.08	.10
334	Cross	.17	.20
335	Tee	.14	.20
336	Elbow, 90 degrees	.11	.15
337	Elbow, External	.11	.15
338	Elbow, Internal	.11	.15
339	Drop Cord Box	.25	.30
341	Junction Box	.25	.30
342	Snap, SW. Base, 5 Amp	.25	.30
342-R	Snap, SW. Base, 10 Amp	.25	.30
344	Base Coupling	.025	.05
345	Single Clamp	.007	.05
348	One-Piece Rosette	.09	.15
354	Double Clamp	.015	.05
355	Ground Clamp	.06	.10
356	Keyless Receptacle	.38	.45
360	Attach Plug (Porcelain Plug)	.38	.45
360-A	Attach Plug (Composition Plug)	.41	.50
363	Canopy Adapter Plate, 4½ in. Split Type	.25	.30
363-A	Cover for No. 363, Solid Type	.15	.20
363-B	Cover for No. 363, Split Type	.17	.20
365	Canopy Base 4½ in	.35	.45
366	Canopy Base, 6 in	.50	.60
367	Porcelain Cover for No. 404, 2 Hole	.10	.15
368	Porcelain Cover for No. 404, 3 Hole	.10	.15
369	Wood Moulding Coup	.15	.20
375	Outlet Box	.20	.25
376	Corner Box	.25	.30
377	Clamp Bush, Single	.03½	.05
378	Porcelain Cover for No. 375, 1 Hole	.10	.15
379	Porcelain Cover for No. 375, 2 Hole	.10	.15
380	Porcelain Cover for No. 375, 3 Hole	.10	.15
381	Porcelain Cover for No. 375, 4 Hole	.10	.15
383	Blank Cover for No. 375	.05	.08
390	Attach, Plug (Porcelain Plug)	.35	.45
390-A	Attach Plug (Composition Plug)	.39	.50
391	5 Amp. SP. Snap SW., Non-indicating	.36	45
392	5 Apm. SP. Snap, SW., Indicating	.39	.45
395	Chain-Pulling Recep., Moulding Type	.64	.75
396	Chain-Pulling Recep., Sub-Base Type	.62	.75
397	Key Recep., Moulding Type	.41	.50
398	Key Recep., Sub-base Type	.39	.45
399	Keyless Recep., Sub-base Type	.27	.35
401	Box Connector, ½ in	.15	.20
401-A	Box Connector, ¾ in	.20	.25
402	Conduit Coup., ½ in	.15	.20
402-A	Conduit Coup., ¾ in	.20	.25
403	Elbow Coup., ½ in	.18	.25
403-A	Elbow Coup., ¾ in	.22	.25
404	Open Work Coup	.18	.25
405	Cond. to Mould Tee	.35	.45
405-A	Cond. to Mould Tee	.40	.50
410	Fixture Box	.35	.45
411	Moulding to Cond. Tee, ½ in	.25	.30
411-A	Moulding to Cond. Tee, ¾ in	.30	.35
414	Armored Cable Coup	.20	.25

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		List.	Sell.
416	90 degree Elbow Coup., Right Hand	.18	.25
416	90 degree Elbow Coup., Left Hand	.18	.25
417	½ in. Elbow Coup	.18	.25
417-A	¾ in. Elbow Coup	.22	.25
418	Punch	.039	.05
419	Toggle Bolts		
	⅛x4	.075	.10
	3/16x4	.085	.10
	¼x4	.09	.15
420	Toggle Bolts.		
	5/32x2	.03	.05
	5/32x3	.033	.05
	5/32x4	.037	.05
421	Shield	.065	.10
422	Shear	.036	.05
423	Sub Base	.20	.25
424	Sub. Base	.30	.35
425	Clamp	.007	.05
426	Strip	.044	.05
427	Strip	.055	.10
428	Clamp	.01½	.05
429	Rosette	.35	.40
430	Rosette	.40	.45
431	Rosette	.28	.35
432	Rosette	.25	.30
433	Bushing	.12	.15
434	Clamp	.036	.05
435	Clamp	.045	.10
436	Coupling	.015	.05
437	Elbow	.11	.15
437	45 Degree Elbow	.11	.15
438	Flush S.W. Box	.40	50
441	Flush S.W. Adapter, Single Gang Split Type	.55	.70
442	Adapter	.55	.60
443	Single Strip	.20	.25
444	2 gang strip	.40	.45
445	3 gang	.60	.70
446	4 gang	.80	.90
447	Plug Plate	.12	.20
448	Blank Plate	.12	.20
451	Push Plate, 1 Gang	.12	.15
452	Push Plate, 2 Gang	.24	.30
453	Push Plate, 3 Gang	.36	.45
461	Rotary Plate, 1 Gang	.12	.15
462	Rotary Plate, 2 Gang	.24	.30
463	Rotary Plate, 3 Gang	.36	.40
470	4½ in. Keyless Recep., Metal Cap	.78	.90
471	4½ in. Keyless Recep., Metal Cap	.80	1.00
472	4½ in. Keyless Recep., All Porcelain	.58	.70
473	4½ in. Keyless Recep., All Porcelain	.60	.75
474	3½ in. Keyless Recep., Metal Cap	.60	.75
475	3½ in. Keyless Recep., Metal Cap	.62	.75
476	3½ in. Keyless Recep., All Porcelain	.52	.70
477	3½ in. Keyless Recep., All Porcelain	.55	.70

(To be continued.)

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